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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/758,715	01/11/2001	Kenneth Lloyd Westra	THOLAM P139US	9530

20210 7590 03/01/2004

DAVIS & BUJOLD, P.L.L.C.
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EXAMINER	
LAVARIAS, ARNEL C	
ART UNIT	**PAPER NUMBER**
2872	

DATE MAILED: 03/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/758,715	WESTRA ET AL.	
	Examiner	Art Unit	
	Arnel C. Lavarias	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 December 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendments to Claim 45 in the submission filed 12/11/03 are acknowledged and accepted.

Response to Arguments

2. The Examiner notes the remarks (See Page 3 of submission filed 12/11/03) made in regard to the 35 U.S.C. 112, 1st paragraph rejection (See Section 11 of Paper No. 17, dated 8/11/03). Although it is true that deep reactive ion etching is one technique for anisotropically etching a material independent of that material's crystal planes, Applicants still have not addressed the concern that the specification of the disclosure fails to reasonably disclose or provide adequate support for the claimed recitation of "an inlet passage and an outlet passage anisotropically etched independent of crystal planes".

3. In view of the amendments made to Claim 45, the rejection of Claim 45 under 35 U.S. C. 112, 2nd paragraph in Section 12 of Paper No. 17, dated 8/11/03, is respectfully withdrawn.

4. The Applicants further argue that, with respect to newly amended Claim 45, Stanley '500 in view of Stanley '658 and Madou fails to teach or reasonably suggest a high reflectivity micro mirror, wherein only that portion of the selected crystalline plane required as the mirror surface be exposed. The Examiner respectfully disagrees. In Figure 3(a) and 3(b) of Stanley '500, the Examiner notes that the crystalline plane acting

as the mirror surface (See 38 in Figure 3(a)) is the surface that is exposed. It is noted that the whole surface 38 is required to be the mirror surface since the movement of the cantilever beam adjusts the location of the light spot on the mirror surface. Thus, the whole surface 38 is required to be exposed to reduce the chances of light loss. Further, regarding the limitation that the mirror be 'fixed', Applicants have taken a narrower interpretation of the term 'fixed', i.e. stationary. However, the Examiner notes that the mirrors disclosed by Stanley '500' and Stanley '658 are fixed in the sense that the mirrors are securely fastened to the substrate, i.e. fixed to the substrate.

5. In view of the amendments above, Claim 45 is rejected as follows.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claim 45 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 45, as currently amended, recites the limitation of a high reflectivity micro-mirror, comprising in particular an inlet passage and an outlet passage anisotropically etched independent of crystalline planes, which intersect at the selected crystalline plane.

However, the Applicants' disclosure fails to provide support for the inlet passage and outlet passage being anisotropically etched *independent of crystalline planes*. Further, Applicants have argued that deep reactive ion etching is one method for anisotropically etching a material independent of that material's crystalline planes. However, such a disclosure is not present in the specification of the disclosure, even if such a method does allow one skilled in the art to anisotropically etch a material independent of that material's crystalline planes. Finally, the specification of the disclosure fails to discuss how one skilled in the art would even apply such a technique, or any other technique for anisotropically etching a material independent of that material's crystalline planes, to the instant invention.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stanley et al. (U.S. Patent No. 5024500 or Stanley '500), of record, in view of Stanley (U.S. Patent No. 4854658 or Stanley '658), of record, Madou (M. Madou, "Fundamentals of Microfabrication", CRC Press, Washington, DC, 1997, pp. 148-154), of record, and Kishida et al. (U.S. Patent No. 6112001).

Stanley '500 discloses a high reflectivity micro mirror (See for example Figures 3-4), comprising a homogeneous monolithic bulk crystal silicon (See 34 in Figure 3) having an anisotropic body (inherently, bulk crystal silicon has an anisotropic body with multiple crystalline planes, each crystalline plane etching at different etch rates due to the differing atom densities and bonding structures of each crystalline planes) with several crystalline planes (in the instant case, the selected crystalline plane is taken to be the plane defined by reflector surface 38 in Figure 3), and a fixed mirror surface (See 38 in Figure 3; It is noted that the mirror surface is fixed, or securely fastened to the main body substrate 34 by arms 35 and 36) co-extensive with a portion of a selected one of the several crystalline planes, the mirror surface being positioned internally within the body, with only that portion of the selected crystalline plane required as the mirror surface being exposed (It is noted that the whole surface 38 is required to be the mirror surface since the movement of the cantilever beam adjusts the location of the light spot on the mirror surface.). Additionally, Stanley '500 discloses an inlet passage (See for example 300 in Figure 3) and an outlet passage (See for example 301, 302 in Figure 3) that intersect at the selected crystalline plane. Stanley '500 lacks the mirror surface being co-extensive with a selectively *anisotropically etched* portion of the crystalline plane and the inlet passage and outlet passage being *anisotropically etched independent of crystalline planes*. However, Stanley '658 similarly teaches a high reflectivity micro mirror (See Figure), the mirror including a homogeneous monolithic bulk crystal silicon having an anisotropic body with several crystalline planes (See 1 in Figure); a fixed mirror surface co-extensive with a selectively exposed portion of the crystalline plane (See 6 in Figure; It is noted that

the mirror is securely attached to the substrate body near 7 in Figure), the mirror surface being positioned internally within the body, with only that portion of the selected crystalline plane required as the mirror surface being exposed (It is noted that the whole surface of mirror 6 is required to be the mirror surface since the movement of the cantilever beam adjusts the location of the light spot on the mirror surface.); and an inlet passage and an outlet passage (See 2-4 in Figure) formed by anisotropically etching grooves in the silicon (See col. 2, lines 25-35). Additionally, Madou teaches a method of anisotropically etching vertical and angled sidewalls in bulk silicon by properly aligning the mask opening with particular planar orientations of the bulk silicon (See pages 149-153 on a discussion of anisotropic etching of [100]-oriented bulk silicon, and in particular, pages 151-152 and Figures 4.9 and 4.10 with regards to etching vertical (90 deg.) sidewalls and pages 149-151 and Figures 4.7 and 4.8 regarding angled (54.74 deg.) sidewalls). Finally, Kishida et al. teaches a method of forming grooves in a substrate, wherein the methods may include wet chemical anisotropic etching, dry etching such as reactive ion etching (a method of anisotropic etching that is independent of crystalline planes), photolithography, or mechanical cutting (See 4 in Figure 1; col. 6, lines 10-16). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the mirror surface be co-extensive with a selectively *anisotropically etched* portion of the crystalline plane and the inlet passage and outlet passage being *anisotropically etched independent of crystalline planes*, as taught by Stanley '658, Madou, and Kishida et al., in the high reflectivity micro mirror of Stanley '500. One would have been motivated to do this to take advantage of existing

lithographic methods for patterning on bulk silicon, as well as existing well-known anisotropic etchants, such as potassium hydroxide (KOH) or tetramethyl ammonium hydroxide (TMAH). One would further have been motivated to use anisotropic etching methods that are independent of crystalline planes to take advantage of the higher etch rates and selectivity of such methods, while avoiding the disadvantages of wet chemical anisotropic etching techniques, such as depletion of chemical etchants, temperature dependence of the etching rate, disposal of chemicals, etc.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent Application Publication US 2003/0091290 to Whitehead.

Whitehead similarly discloses a high reflectivity micromirror formed in a bulk crystalline silicon substrate (See Figure 1), the mirror (See 130 in Figure 1) being formed on the surface co-extensive with an anisotropically etched portion of a selected crystalline plane, and an inlet passage and outlet passage (See 110, 120 in Figure 1). However, it is noted that Whitehead is unavailable as a reference due to the effective filing date of the instant application.

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arnel C. Lavarias whose telephone number is 571-272-2315. The examiner can normally be reached on M-F 8:30 AM - 5 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Arnel C. Lavarias
2/11/04

THONG NGUYEN
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